

Coordinating Public Debt Management
with Fiscal and Monetary Policies:
An Analytical Framework

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Abstract

This paper proposes a sovereign asset and liability management framework for analyzing the inter-relationships between debt management, fiscal and monetary policies. It illustrates the consequences of uncoordinated policy mix and extends Sargent and Wallace (1981 and 1993) by including debt

management. Examples of policy games played by fiscal, monetary, and debt management authorities reinforce the importance of policy separation and coordination to prevent domination by one authority over another which could lead to inconsistent policy mix.

This paper—a product of the Banking and Debt Management Department—is part of a larger effort in the Department to investigate and disseminate sound practices in public debt management. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The author may be contacted at etogo@worldbank.org.

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Coordinating Public Debt Management with Fiscal and Monetary Policies: An Analytical Framework

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Coordinating Public Debt Management with Fiscal and Monetary Policies: An Analytical Framework

1. Introduction

There is growing consensus that public debt management should be integrated into a broader macroeconomic framework of analysis, but to date, there is little literature that places it into a coherent analytical framework. Following Anderson (1999), Wheeler (2004) and Jensen (mimeo) this paper proposes a sovereign asset and liability management (ALM) framework for integrating debt management to the overall macroeconomic framework of analysis.

Existing literature on optimal fiscal and monetary policies is well established. However, they have largely been developed in isolation (see for example, Chari and Kehoe, 1999, Blanchard and Fisher 1989) or where their interactions are examined, such as Sargent and Wallace (1981, 1993) the focus has been on the consequences of uncoordinated policies. The literature on debt management, on the other hand, has mostly developed in support of fiscal or monetary policies:² for example, Barro (1995) identified the role of debt management in tax smoothing, and Calvo and Guidotti (1990) identified the role of debt management as a commitment device in ensuring a time consistent monetary policy.

The objective of this paper is to fill the gap in the literature and to establish public debt management as a separate policy with a different objective from those of fiscal and monetary policies, and to integrate public debt management into a broader macroeconomic framework of analysis. The approach taken is *not* one of developing a joint optimization problem, but rather one of illustrating the importance of policy separation and coordination that ensures a consistent policy mix. It also illustrates the consequences of uncoordinated policies by extending the model developed by Sargent and Wallace (1981, 1993).

² Useful literature reviews covering these are Missale: 1997, Leong: 1999, Chrystal: 1999.

The paper is structured as follows. Following this introduction, section 2 establishes the case to separate debt management from fiscal and monetary policies. However, separation does not preclude the need for policy coordination. This is because in the real world, there are policy interactions, and therefore the importance of a coordinated approach to determining a consistent policy mix is discussed. Section 3 then asks: Is there a way to analyze the policy coordination in a coherent manner? It is argued that the ALM framework offers a useful conceptual framework for analyzing the coordination between debt management, fiscal and monetary policies and the foundation for the analysis is laid out. Section 4 discusses the consequences of uncoordinated policies based on Sargent-Wallace (1993), extending it by including an additional policy player: the debt manager. Section 5 concludes the paper.

2. Separating Debt Management Policy from Fiscal and Monetary Policies and the Importance of Policy Coordination

Traditionally, debt management policy was not considered a separate macroeconomic policy, but was subordinated to fiscal and monetary policies.³ This is with good reasons: managing the volatility of debt servicing cost through sound debt management has clear implications for securing short-term fiscal space as well as the management of long-term fiscal risks. Debt management is also a concern for the conduct of monetary policy when viewed as the management of the composition of assets available to the public between money and government paper.⁴ The literature on debt management has followed this pattern: for example, the tax smoothing literature assigned the role of debt management in support of fiscal policy, and the time consistency literature assigned its role in support of monetary policy.

³ Policy separation should be accompanied by clear accountability framework and institutional arrangements in order to enhance credibility. See for example, Currie, Dethier and Togo (2003) for a description of the evolution of debt management in OECD countries and for a discussion on the institutional arrangements for debt management.

⁴ Through open market operations.

However, there is growing consensus among practitioners that debt management should be treated as a separate macroeconomic policy with its own policy objectives and the assignment of a separate policy instrument. The trend was started by the New Zealand government in the 1980s, when the then incoming government recognized that without proper policy assignment and accountability framework for debt management, the risk remained that the fiscal targets set in the newly adopted Fiscal Responsibility Act would not be met. In Europe, several countries that were heavily indebted in the late 1980s and early 1990s such as Belgium, France, Ireland, and Portugal took the decision to decentralize debt management to varying extent, in order to reduce the variability of debt service cost that could jeopardize the targets set by the Growth and Stabilization Pact. In the U.K., debt management responsibilities were taken out of the Bank of England in order to eliminate even the perception of conflict of interest in conducting debt management and monetary operations.

One of the main reasons for decentralizing debt management was that at least in the short run, the pursuit of the three policy objectives involved trade-offs, and the assignment of separate policy objectives would enhance the credibility and effectiveness of policy implementation. For example, where the fiscal authorities are responsible for managing both fiscal policy and debt management policy, the fiscal authority may wish to keep the cost of debt servicing low in order to create fiscal space in the short run. However, this may increase the volatility of future debt servicing and may force subsequent governments to cut expenditures or raise taxes. While the fiscal authorities should be concerned with the long-term consequences, the reality is that they are often subjected to political pressures arising from election cycles that lead them to take myopic policy choices.

Similarly, the core objective of the monetary authority is to control inflation, but if it was also responsible for debt management, it may be tempted to hold interest rates low. This will help to keep debt servicing costs low, but risks the possibility of higher inflation in the future. Alternatively, the monetary authority may be tempted to issue inflation indexed debt to enhance their policy credibility, but raises the risk of increasing debt

service volatility. Separating the management of debt from the management of fiscal and monetary policies can help avoid such conflicts, real or perceived, and can improve policy credibility.

Credible policies are known to produce superior overall outcomes compared to less-credible policies. For example, a credible monetary policy will be successful in taming inflationary expectations and reduce future uncertainty, which will in turn reduce the risk premium on longer dated domestic currency debt. Lower long-term interest rates are also likely to stimulate economic growth and improve the fiscal position, and help to reduce the fiscal deficit and debt burden.⁵ This will further reinforce the credibility of monetary policy. The experiences of New Zealand, Sweden, Denmark, and Ireland since the 1990s show that the implementation of a credible, coherent macroeconomic policy mix has helped generate such virtuous cycle, improving welfare of the society as a whole.

What then are the separate policy objectives and the instruments used in the conduct of debt management, fiscal policy and monetary policy? For debt management, the objective is to ensure that the government's financing needs and its payment obligations are met at the lowest possible cost over the medium to long run, consistent with a prudent degree of risk.⁶ This may be expressed as a numerical target for the stock composition of the debt, referred to as the strategic benchmark or the strategic target. The policy instrument is medium to long-term debt, and the composition is managed through *new* debt issuance, as well as changing the composition of *existing* debt through interest rate and exchange rate swaps, debt buybacks and exchange offers. The objective of fiscal policy is to achieve the least distorting budgetary policy that would stabilize output, improve the resource allocation and to manage the distributive effects.⁷ Overall target for fiscal policy is typically set for the primary balance. Managing the composition and level of spending and taxes are instruments used to achieve these policy objectives. Finally,

⁵ Provided primary expenditures levels are controlled.

⁶ World Bank and IMF (2001).

⁷ For example, the stated fiscal policy objective in the UK is, over the medium-term, to ensure sound public finances and that spending and taxation impact fairly both within and across generations. The long-term fiscal objective for New Zealand is to operate surplus on average over the economic cycle sufficient to meet the requirements for contributions to the NZ Superannuation Fund and ensure consistency with the debt objective (<http://www.treasury.govt.nz/budget2006/fiscalstrategy/04.asp>).

the objective for monetary policy is to achieve price stability, while maintaining output stabilization. Targets for inflation, interest rates, monetary aggregates, or the exchange rate are managed through open market operations or through non-market controls such as setting reserve requirements.

However, the effectiveness of policy decentralization and its credibility depend on two further conditions. The first is that complete policy decentralization is only possible under very restrictive assumptions, such as the availability of n policy instruments when there are n policy objectives (Tinbergen 1952) and these instruments need to be independent of one another, in the sense that the effects of any one instrument on the objectives are not proportional to those of another, or of any combination of others (Tobin 1993). Lump sum taxation would be one such example of an orthogonal instrument, as is state contingent debt.

While such strict instrument orthogonality is in practice rarely observed and unnecessary, the shortage of policy instruments tends to be more marked in less developed economies. For example, it is common to see both the monetary authority and the debt manager operating in the primary market to pursue their respective policy objectives.⁸ Where the monetary authority issues its own debt and incurs direct interest cost, the public will perceive that it would have less incentive to raise interest rates to curb inflation, as it may wish to keep rates low in order to contain the cost of borrowing.⁹ In essence, the shortage of instruments may force the authorities into potential conflict and weakens the credibility of their ability to achieve their main policy goal.¹⁰

⁸ See for example, World Bank (2007). In Costa Rica, Indonesia, Lebanon, and Nicaragua, both the central bank and the ministry of finance issue short-term debt in the primary market.

⁹ It has been observed in some countries that even if the central bank issues government debt on behalf of the ministry of finance through an agency agreement, the central bank feels compelled to keep the rates low to lower the costs of the debt.

¹⁰ One of the reasons governments encounter less instruments than the number of objectives is due to incomplete markets, either due to the underdevelopment of the domestic government debt markets or simply because it is too expensive to have complete markets. For example, if the government lacks the credibility that it is willing or able to honor the debt, then the market may demand prohibitively high risk premia to issue long-term fixed rate debt in domestic currency. Or it may simply lack a policy to developing the domestic market, resulting in no or little incentives for the private sector to transact in the secondary market. The discussion on instrument independence helps highlight the importance of developing the domestic debt market from the perspective of macroeconomic stabilization policy.

The effectiveness of policy decentralization and the credibility of the respective authorities also hinges on the coherence of the overall policy mix. A policy mix that is inconsistent, such as a pro-cyclical fiscal policy under a fixed exchange rate regime, can strain the credibility of the monetary authority's commitment to defend the currency. If the market observes that the policies cannot be sustained, then the pressure will build to change the policy mix.

Here, we define policy coordination to mean some form of decision-making process that determines a consistent policy mix that would result in the type of society that citizens want their elected government to implement. Governments would therefore need to figure out the desired economic outcome, and determine the policy mix through policy coordination that most effectively achieves this outcome. In order to determine the desired economic outcome, ranking of preferences must be made.

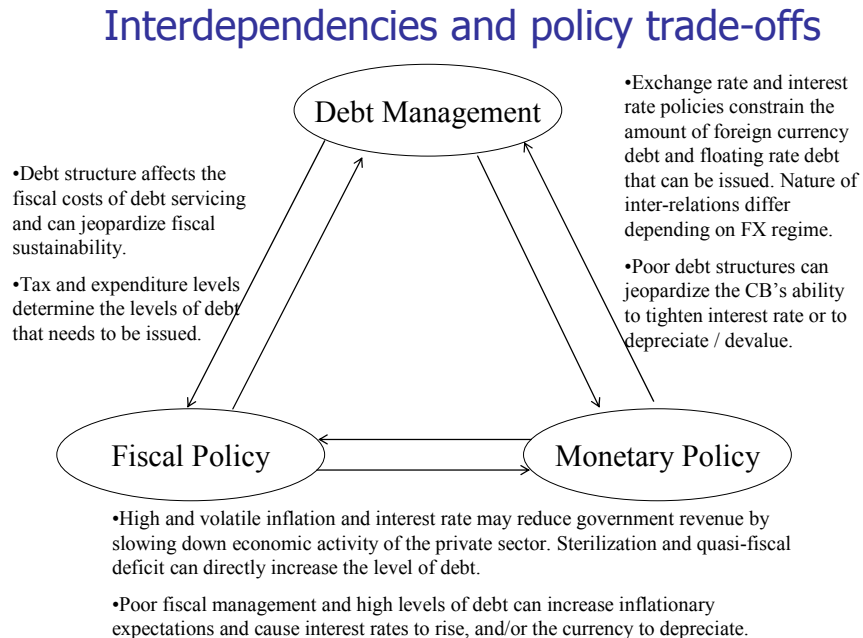
Ranking of preferences invariably involves trade-offs: this is simply because with limited resources, society cannot have all its wants and needs satisfied. The relevant trade-off in our context is the trade-off between fiscal, monetary, and debt management policies given the government's inter-temporal consolidated budget constraint.¹¹ For example, greater current period primary deficit can be supported with a low financing cost/high risk strategy. Alternatively, it can be financed through easy monetary policy which increases seigniorage income in the current period.¹² However, this choice of policy mix may mean that fiscal space may be reduced in the future if debt servicing costs increase

¹¹ The government will also have to face policy trade-offs *within* fiscal, monetary and debt management policies through the choice of different policy instruments available to each of them, as well as *between* the policies. Trade-offs within fiscal policy includes the trade-off between efficiency versus equity as well as intertemporal allocation of the tax burden. Similarly, the debt manager faces the decision whether to take on additional risk to lower the debt servicing cost. If citizens are poor and are unable to assume the additional risk that the government takes, then the government may want to act conservatively and minimize risk such as that coming from foreign currency exposure. Finally, the trade-off that the monetary authority faces may be between inflation and unemployment or whether to rein on inflation today or in the future.

¹² Although the assumption that seigniorage provides net income to government may be strong for two reasons: first, empirical evidence suggests that seigniorage is not a significant source of government revenue, and second, seigniorage income may not necessarily translate into higher *net* profit transfers to the government. Nevertheless, looking at seigniorage is useful in the context of consolidated government and central bank balance sheet management.

due to the realization of risky events, or monetary policy needs to be tightened to reign in high inflation caused by lax monetary policy in earlier periods.¹³ Policy interdependence and trade-offs between debt management, fiscal policy, and monetary policy are depicted in graph 1 and described in box 1.

Graph 1. Interdependencies and policy trade-offs between debt management, fiscal policy and monetary policy



¹³ The other important consideration is whether current fiscal expenditures are wisely invested so as to generate future economic growth, which will in turn increase tax revenues and keep the debt to GDP ratio low.

Box 1. Policy interdependencies and policy trade-offs

Poor debt management may force the fiscal authority to change its current course of policy as poor debt structures can suddenly increase the costs of debt servicing and force the government to cut planned expenditures in order to meet its debt obligations. Conversely, poor fiscal policy can impact the effectiveness of debt management as tax and expenditure policies determine the levels of primary surplus/deficit and the amount of debt that needs to be issued. When this level is excessive, investors will demand higher risk premium and may constrain debt managers from issuing the desired debt instrument at reasonable costs and achieve the targeted debt composition.

Monetary policy can also constrain the debt manager's actions, as exchange rate and interest rate policies can limit the amount of foreign currency debt and floating rate debt that can be issued. For example, debt managers may feel constrained issuing long-term, fixed rate, domestic currency debt or be forced to issue such debt at very high cost because, for example, investors expect higher inflation or devaluation in the future due to loose monetary policy stance. Under such circumstances, investors may prefer debt indexed to inflation rates or short-term interest rates, short maturity debt or foreign currency indexed debt. In turn, poor debt structures with large shares in short-term debt, floating rate debt or foreign currency debt can constrain the central bank's willingness to increase interest rate or to depreciate / devalue domestic currency, as this can precipitate a debt crisis.

Finally, monetary policy and fiscal policy are interdependent as high and volatile inflation and real interest rates may reduce government revenue by slowing down economic activity of the private sector, and central bank sterilization and quasi-fiscal deficits can directly increase the level of debt. Poor fiscal management and high levels of debt can jeopardize monetary policy objectives as it can increase inflationary expectations and cause real interest rates to rise, and/or the currency to depreciate.

The existence of policy trade-offs may explain why tax smoothing is rarely a stated objective for fiscal policy. Complete tax smoothing is in effect a policy of zero (budgetary) risk regardless of cost (Missale: 1997). The high costs associated with eliminating risk suggest that a zero risk policy is generally not a good idea. This in turn, implies that a reasonable objective for debt management is not minimizing risk *at any cost*, but would be expressed in terms of cost and risk trade-off. Similarly, most central bankers do not pursue a zero inflation policy because of the destabilizing effect on economic output if such a rigid monetary policy is pursued, and therefore are willing to accept non-zero inflation levels and variability.¹⁴

In the presence of policy trade-offs, how can a desired policy mix be determined? One way to achieve the desired policy mix is to have a benign social dictator assign a policy mix, and then each policy maker can pursue its assigned goal through decentralized decision making. A more realistic and democratic decision-making process is for the

¹⁴ Other reasons for not pursuing a zero inflation target are the presence of sticky prices which makes it difficult to make adjustments to relative prices, and the difficulty of how changes in the quality of goods in the CPI basket should be treated.

policy makers to agree to a coordinate policy based on a common vision of society and then to pursue the individual policies in a decentralized way. Coordination should not be difficult if all policy makers embraced the common goal. In practice, coordination involves haggling and negotiating, and/or take the form of some policy rules, but nevertheless these may be arrived at within the parameter of a common goal.¹⁵

Coordination mechanisms to achieve the ‘desired’ policy mix vary. For example, in the EU context, the Stability and Growth Pact is an agreement between the European central bank and the ministry of finance of member governments to set a ceiling on the annual fiscal deficit and the overall debt level in order to facilitate the implementation of the desired monetary policy under a monetary union. Implicit in the pact is that each government will also implement prudent debt management to reduce variability in the fiscal outcomes. The rationale for the Pact is also about establishing policy credibility of the European common currency. Fiscal Responsibility Laws that include target deficit and debt levels play a similar role. Independent institutional arrangement can help to overcome central bank credibility issue, but this is not sufficient unless there is a coordinated and consistent policy mix.

3. Analyzing Policy Consistency in an Asset and Liability Management Framework

Having discussed the importance of policy separation and coordination between debt management, fiscal and monetary policies, is there a way to analyze whether a particular policy mix is consistent? Anderson (1999) Jensen (mimeo) and Wheeler (2004) suggest that the asset and liability management (ALM) framework offers a coherent framework for managing the risks of the public debt portfolio and provides useful insights to understanding the coordination issues between fiscal, monetary, and debt management policies. Such a risk management framework is consistent with the fiscal sustainability analysis, where fiscal, monetary, and debt management policies are subsets of public finance, both on a period by period basis, as well as on an inter-temporal basis.

¹⁵ Research in game theoretic approach of coordinating fiscal and monetary policies have also shown that non-cooperative behavior leads to sub-optimal outcomes and increase variability of prices and output levels (see for example Frankel: 1998).

3.1. Debt Management in an Asset and Liability Management Framework

The ALM framework is useful in identifying and managing risks of the government debt portfolio. The framework suggests that balance sheet risk exists when there is a mismatch between the financial characteristics of the assets and liabilities. Risk therefore is minimized when the financial characteristics of the assets match that of the liabilities. The largest asset of the government is the present value of future flows of the primary surplus, and the financial characteristics of these future flows depend on the fiscal objectives for managing this asset.

The objective for managing the future flows of primary surpluses may be framed in terms of the objective for smoothing taxes.¹⁶ Tax smoothing is preferable if taxes are distortionary (such as income taxes) resulting in economic inefficiency (see Box 2).

¹⁶ Tax smoothing implies that tax revenue increases when there is GDP growth, and tax revenue declines when there is negative GDP growth. Tax smoothing may be more strictly referred to as tax rate smoothing, whereby the objective is to smooth the ratio of tax revenue to GDP.

Box 2. Tax Smoothing (Barro: 1979, 1995)

A good starting point is the Ricardian proposition, whereby if taxes are lump sum, and there exist certainty in economic activities and other conditions, then a tax cut today financed by bond issuance does not lead to increased consumption and thereby output. This is because households foresee that government dis-savings today will be matched by a rise in taxes in the future, so households save for the anticipated rise in taxes by investing in the bonds, keeping the level of national savings unchanged. Households are indifferent with respect to the timing of the tax cut and tax increases as only their present values matter: this makes the timing and composition of public debt irrelevant. Seigniorage is also irrelevant because there is perfect foresight about future prices so the change in money supply over time would be zero. Thus the only binding constraint is that debt equals the present value of future primary surpluses. Because citizens will be indifferent whether the government financed current deficits with taxes or bonds, the policy mix is irrelevant.

If taxes are distortionary, such as taxation on labor income, then the problem of optimal fiscal policy is to minimize distortions created by revenue collection subject to inter-temporal budget constraint.^{1/} Raising revenue creates distortions and the distortions rise more than proportionately to the rise in revenue. This characterization gives rise to the result that distortions are minimized when tax rates are smoothed over time. For example, during a recession, the level of tax revenue will fall with the decline in economic activity. Rather than raising taxes to finance current expenditure, the government should run a primary deficit financed by debt issuance. In boom time, debt should be paid down through the primary surplus resulting from increased revenues accompanying economic growth. Thus, tax rates are smoothed over recession and boom periods through the management of the timing of the debt.^{2/} However, with the assumption of perfect foresight in place, the composition of debt is irrelevant. “This is because perfect certainty for interest rates, price levels, exchange rates, etc, the rational pricing of each instrument on financial markets ensures that each option entails the same time path of real interest payments on the public debt” (Barro: 1999). Again, because taxes will be raised for sure to pay down the debt, and because the time path of real interest payments on the debt is also known for sure, this policy mix is sustainable.

In turn, if there exist uncertainties in the government’s budgetary outlays which affect the tax base or borrowing conditions, then the management of budgetary risk becomes important and the composition of debt becomes relevant. This is because it would be optimal for the government to issue debt whose payoffs are contingent on the relevant risks. The relevant risks are those that impinge on the government’s budget – e.g., uncertainty in government expenditure, the revenue and rates of return payable on government debt (Barro: 1999). For example, to hedge against an unexpected negative shock to GDP, the government can issue debt whose (debt servicing) payout is positively correlated to GDP. With uncertainty, issuing explicit state contingent debt whose debt payout is contingent on the outcome of the primary balance will ensure tax smoothing. In other words, minimizing budgetary risk from the perspective of tax smoothing implies that the composition and timing of debt matters.

^{1/} Taxes are distortionary if they affect the decision of the taxpayer on how much and when to work. In particular, the anticipated variation in tax rates over time can induce changes in the timing of consumption. The government’s objective then is to minimize this distortion. The determination of the tax rate that minimizes the effects of distortions on the tax payers’ behavior in turn, determines the timing and level of the debt.

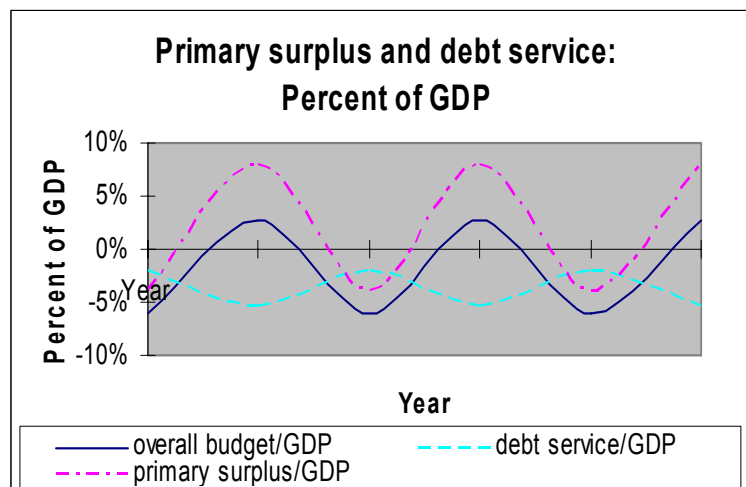
^{2/} As Barro (1999) noted, if the increase in expenditure is permanent, then the appropriate policy response would be to raise taxes.

While tax smoothing may not be a commonly stated objective for fiscal policy, such a tax policy constitutes a class of counter-cyclical fiscal policy characterized by automatic stabilizers which helps to stabilize the economy through the business cycles.

Governments may structure fiscal policy in such a way that the primary surplus is generated when the economy is growing and the primary deficit increase when the economy is in recession. Such a counter-cyclical fiscal policy which stabilizes the economy is a more commonly stated objective for fiscal policy.¹⁷

Given the counter-cyclical objective for managing fiscal policy, the ALM framework suggests that debt structured in such a way that debt servicing (out)flows diminishes when there is primary deficit (and increases when there is primary surplus), would help minimize the risk that taxes must be raised, expenditures reduced, or debt defaulted during a recession or an financial crisis. This is because when the characteristics of government debt matches with the characteristics of the fiscal assets, debt management acts to minimize the variance in the overall budget, while fiscal policy in turn acts as an automatic stabilizer for the economy. A stylized depiction of the matching of debt servicing flows and the primary surplus which reduces the variance of the overall budget is show in graph 2.

Graph 2. A stylized matching of debt servicing flows and primary surplus as a percentage of GDP



¹⁷ For example, the Golden Rule in the United Kingdom. A counter cyclical fiscal policy may comprise a combination of tax smoothing policy and a primary expenditure policy which increases during recessions with the increase in welfare payout such as unemployment insurance and reduces during good times as such payout decreases.

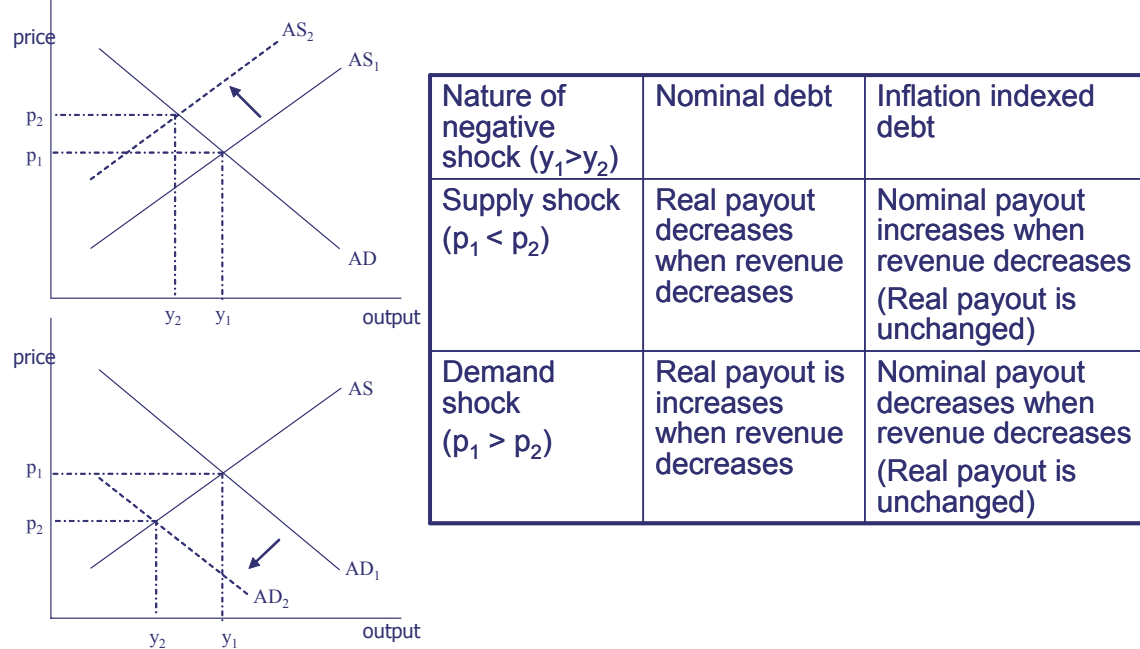
What are the debt instruments that have the desired characteristics? A state contingent debt whose payout is conditional on the realization of the primary surplus would clearly hedge the government from negative shocks to the fiscal assets. For example, a GDP indexed debt, with GDP acting as proxy for tax revenue, could ensure that debt service payments co-move with government revenues. However, because of market imperfections, it is not possible to have a debt that is contingent on all states of nature, while it is certainly possible to issue debt instruments that are contingent on certain states of nature, including conventional debt instruments.

Conventional debt such as nominal fixed rate debt or inflation indexed debt has state contingent characteristics depending on the nature of the economic shock.¹⁸ A negative demand shock causes price levels to fall with the contraction of the economy. With falling prices, a debt whose debt servicing is indexed to the price level would hedge the fiscal position when revenues fall and demands on expenditures rise as a result of increases in items such as unemployment claims.

A hedge on the fiscal position would also be obtained with nominal, fixed rate debt where there is a negative supply shock. A negative supply shock will be accompanied by a combination of falling output and rising price levels. A counter cyclical fiscal policy means that tax revenues decline and expenditures increase with GDP, and a debt structure characterized by nominal debt decreases the real debt service payout during the recession. Such a debt instrument supports the counter-cyclical fiscal policy over time in an economy faced with supply shocks. The relationship between negative supply and demand shocks and the debt instruments that hedge government finances from these shocks are depicted in graph 3.

¹⁸ This depends on the structure of the economy. For example, an oil importing economy is likely to experience a supply shock.

Graph 3. Impact of negative aggregate supply and demand shocks and the desired debt instrument



In practice, because the timing and the nature of the shock is uncertain, it is not possible to know ex-ante the ‘desired’ composition of debt that would hedge the fiscal position. In the real world, governments attempt to identify “combinations of conventional debt to make the real return on public debt conditional on future events” (Missale: 1997) in order to reduce the budgetary risk arising from volatile debt servicing.¹⁹ For example, a debt composition with a mix of long-term price indexed and nominal debt may neutralize the impact of demand and supply shocks, minimizing the fluctuation in debt servicing costs. Further, diversification of debt instruments may help reduce cost and risk at the same time. The alternative for the debt manager is to ensure that debt service (including paying down the debt) is increased during good times so that they can afford to issue expensive debt and secure the necessary financing during bad times.

Another financial characteristic that can create a mismatch between the government assets and liabilities is the cyclical characteristics of risk premium. For emerging economies, recessions tend to be associated with higher risk premium, which means risk

¹⁹ With underdeveloped debt market, such combinations may not be feasible, or may only be implemented at very high cost.

premium is pro-cyclical (exacerbates recessions and booms).²⁰ The cyclical characteristic of the risk premium is closely tied to the cyclical properties of international capital flows. For example, Kaminsky, Reinhart and Végh (2004) showed that capital inflows tend to be pro-cyclical for a large number of countries. The cyclical characteristics of the capital flows are an important factor to consider when a large part of the public finance depends on external sources of funding.

What is the implication for debt management when risk premium and capital flows are pro-cyclical? When these are pro-cyclical, they suggest that increased refinancing needs during recession or a crisis when government revenues are low is not a good idea. And since the timing of a recession or a crisis may be difficult to forecast, it suggests that it is more desirable to issue long-term debt, or to minimize the concentration of maturing debt in one period.

The need to take into account risk premiums may be another reason why state contingent debt is not issued: issuance of state contingent debt may incur prohibitively high costs, particularly because of the counter-cyclicalities of investor risk aversion and the pro-cyclicalities of the risk premium that this implies. Paying fully for the risk premium may mean that the fiscal space for the current period is significantly reduced, and a zero risk policy may not be desirable. Determining the trade-off between how much shock the fiscal and monetary authorities are willing to absorb when the risky event materializes, and how much cost the government is willing to pay to avoid such a shock, should therefore be the central subject of policy coordination.

3.2. Consequences of Uncoordinated Policies with Debt Management

In this section, the unpleasant monetarist arithmetic of Sargent and Wallace (1981) is extended with debt management by incorporating the ALM framework of analysis. We begin by reviewing the original Sargent and Wallace (1981) setting. The starting point is

²⁰ The pro-cyclicalities of risk premium is more pronounced when crisis period is examined (see for example Broner, Lorenzoni and Schmukler: 2005).

the consolidated government budget constraint, where the budget deficit at time t is financed by 1) issuing bonds and/or through 2) seigniorage:

$$D_t - D_{t-1} = r^f * D_{t-1} - PB_t - \frac{M_t - M_{t-1}}{p_t} \quad (1)$$

where D_t is real debt at time t , PB_t is the real primary balance, $M_t - M_{t-1}$ is the nominal value of seigniorage generated between time $t-1$ and t , p_t is the price level, and r^f is the safe real interest on the debt. The equation says that the change in debt is equal to interest payments, less the primary surplus and seigniorage.

As Bohn (1991) notes, the budget constraint imposes no restrictions on *government policy*, and we need to introduce additional restrictions. One basic restriction is to impose a feasibility constraint, whereby the debt level and the capacity to tax is limited by the level of income. This is achieved by dividing both sides of equation (1) by GDP. To simplify, we let GDP grow by a constant rate n so that $GDP_t = (1+n) GDP_{t-1}$. Letting lower case denote ratios to contemporaneous GDP we have:

$$d_t = \left(\frac{1+r^f}{1+n} \right) d_{t-1} - pb_t - \frac{M_t - M_{t-1}}{p_t * GDP_t} \quad (2)$$

Fiscal policy is described by a sequence pb_1, pb_2, \dots, pb_t , where pb_t is the primary balance at time t . Monetary policy is described by a time path M_1, M_2, \dots, M_t , where M_t is the stock of high powered money at time t . Following Sargent and Wallace, we let M_1 as pre-determined and let alternative monetary policies be defined by alternative constant growth rate θ for M_t , $t=2, 3, \dots, T$. For $t > T$, it is assumed that the path of M_t is determined by the condition that the debt to GDP ratio be held constant at the level at $t = T$. The exercise is then to examine the consequences of the choice of θ and T .

With M_1 taken as given, we assume

$$M_t = (1 + \theta) M_{t-1} \quad (3)$$

A monetary policy is considered to be tighter for a smaller θ . Suppose the price level is determined by the quantity theory of money with constant velocity $v_t = v$, so that real balance is a constant:

$$\frac{M_t}{GDP_t * p_t} = \frac{1}{v} \quad (4)$$

Inflation rate can then be expressed as

$$\frac{p_t}{p_{t-1}} = \frac{(1+\theta)M_{t-1}/(1+n)GDP_{t-1}}{M_{t-1}/GDP_{t-1}} = \frac{1+\theta}{1+n} \quad (5)$$

and seigniorage is a constant:

$$\sigma_t = \sigma = \frac{M_t - M_{t-1}}{GDP_t * p_t} = \frac{(1+\theta)M_{t-1} - M_{t-1}}{(1+n)GDP_{t-1} * [(1+\theta)/(1+n)]p_{t-1}} = \frac{\theta/v}{1+\theta} \quad (6)$$

Equation (6) shows that when monetary policy is specified through θ and T , the inflation rate is determined for $t = 2, 3, \dots, T$. Sargent and Wallace proceed to examine how the inflation rate for the period after T depends on the inflation rate chosen for the period before T . They do this in two steps: first, determine how the inflation rate after time T depends on the stock of debt at $t = T$, $d_{\theta T}$; and second, show how $d_{\theta T}$ depends on θ .

To find the dependence of the inflation rate for $t > T$ on $d_{\theta T}$, we let $M_t = p_t * GDP_t / v$, and $d_t = d_{t-1} = d_{\theta T}$ for any date $t > T$. Then (2) can be re-written as:

$$d_{\theta T} = \left(\frac{1+r^f}{1+n}\right) * d_{\theta T} - pb_t - \frac{p_t * GDP_t - p_{t-1} * GDP_{t-1}}{v * p_t * GDP_t} \quad (7)$$

re-arranging we have,

$$\left[\left(\frac{r^f - n}{1+n}\right) * d_{\theta T} - pb_t\right] * v = 1 - \frac{p_{t-1} * GDP_{t-1}}{p_t * GDP_t} = 1 - \frac{p_{t-1} * GDP_{t-1}}{p_t * (1+n)GDP_{t-1}} = 1 - \frac{p_{t-1}}{p_t * (1+n)} \quad (8)$$

If $r^f - n > 0$ as is assumed in Sargent and Wallace (1981), we have that the higher the debt level at time T , the higher the inflation rate, p_t/p_{t-1} must be for $t > T$ in order to keep debt constant at the level reached in time T .

We now introduce debt management in this model. Three modifications to Sargent and Wallace are warranted. First, Sargent and Wallace model assumed that there is perfect foresight and no uncertainty, so the model has no randomness in it. In our model, uncertainty is introduced, which makes the composition of debt relevant, because governments cannot foresee the state of nature when debt service must be made and may not be able to service their obligations if this coincides with the timing of falling revenues.²¹²² “In a stochastic setting, spending and taxes do not provide a complete specification of government policy because the government still has to decide what kind of securities should be issued” (Bohn: 1995).

Second, if insurance to reduce the degree of uncertainty is introduced, then the cost of insurance must be explicitly incorporated into the budget. This will introduce a cost and risk trade-off for the choice of debt instrument that the government decides to issue. It also means that the rate of interest on the debt r is not a constant.²³

Third, Sargent and Wallace (1981) defined debt management as the choice the central bank faces with respect to the amount of debt to be issued versus the amount of seigniorage to be recovered in order to fill the financing gap. Debt management defined in this manner is conducted through open market operations, by exchanging debt with monetary base. In our model (and this paper in general), debt management is defined as the management of the composition of debt of different maturities, currencies, and interest rates, as defined in the Guidelines for Public Debt Management.²⁴ The central bank, in turn, is assumed to confine its decisions to the determination of the amount of debt versus seigniorage to be recovered through monetization. The initial level of debt,

²¹ In their model, the path of fiscal policy and monetary policy were announced at the beginning of the period ($t = 1$) and known by private agents. They note that ‘once we assume that, it does not matter whether nominal or indexed debt is issued from $t = 1$ onward’.

²² If seigniorage is not a constant, then the timing of seigniorage, as well as the composition between debt and seigniorage becomes important.

²³ This brings in the need for assessing the impact on economic growth and tax revenues, etc, but this paper does not consider these effects.

²⁴ “Sovereign debt management is the process of establishing and executing a strategy for managing the government’s debt in order to raise the required amount of funding, achieve its risk and cost objectives, and to meet any other sovereign debt management goals the government may have set, such as developing and maintaining an efficient market for government securities”.

in turn, is determined by the fiscal authority, as is the subsequent stream of primary balances.

Suppose now that instead of safe debt whose payout is fixed at $1+r^f$, the government issues a debt whose payout, $1+r(s_t)$, is contingent on the state of nature at time t .

Suppose also that the outcome of the primary balance is contingent on the state of nature at time t , $pb(s_t)$. If the government can issue such a debt, then the co-movement between the debt payout and the primary balance will hedge the government finance and the result is equivalent to the certainty case, i.e., future inflation is determined by the behavior of the fiscal authorities before time T . However, the cost of issuing a state contingent debt or any debt that reduces risk must also be taken into account. Cost considerations may in turn require that the government assume some risk. This implies that there is a need to consider the cost and risk trade-off of issuing debt, which in turn has some implications for current and future period inflation, as we show next.

One consequence of issuing a state contingent debt is that the discount rate is unknown ex-ante and will differ from the risk free rate. Indeed, it would be reasonable to assume that the expected value of such a discount rate would be greater than the risk free rate, i.e., that investors would demand a risk premium to purchase such a debt. Risk premium should be determined by the creditor's willingness to lend to the government, and this in turn depends on the assumption about the investor's behavior. The consumption based asset pricing (CAPM) model is useful in this regard.

Drawing on CAPM, we can express the discount rate specific to state contingent debt as the marginal rate of substitution to consume by the asset holder (see for example, Bohn: 1991, 1995): the welfare maximizing investor trades off his utility by foregoing a unit of known consumption at time $t-1$, and purchasing a unit of consumption at time t . The consumption trade-off is achieved by storing wealth in the form of government debt which pays interest, $1+r(s_t)$, that is conditional on s_t . The loss in utility at time $t-1$ is given by $U'(C_{t-1})$, and the expected gain in consumption utility at time t is $E_{t-1}\{\beta U'(C(s_t))$

$\{[1+r(s_t)]\}$. The rational investor will continue to trade her consumption utility until she is indifferent between the two choices:

$$1 = \frac{E_{t-1}\beta U'(C(s_t))}{U'(C_{t-1})} * [1 + r(s_t)] \quad (9)$$

Risk premium, expressed as the difference between the expected payout of the state contingent debt and the payout on risk free debt, is given by:

$$RP_t = E_{t-1}[r(s_t)] - r_t^f = -(1 + r_t^f) * Cov\left[\frac{\beta U'(C(s_t))}{U'(C_{t-1})}, 1 + r(s_t)\right] \quad (10)$$

Since risk premium is positive, equation (10) suggests that the covariance between the marginal rate of substitution in consumption utility and the return on the state contingent debt must be negative. From the investor's perspective, "such an asset tends to have low returns when investors have high marginal utility. It is risky in that it fails to deliver wealth precisely when wealth is most valuable to investors. Investors therefore demand a large risk premium to hold it" (Campbell 1999). From the issuer's perspective, the risk premium is the insurance premium that the government pays in order to ensure that debt service is made when the funds are available, i.e., when the economy is strong and the primary surpluses are high. In other words, the risk premium buys the government a hedge which generates a positive covariance between debt service and the primary surplus. For example, if the primary surplus has long duration, then a government debt with a long duration will have a positive covariance with the primary surplus and reduces the risk for the government. But in order to issue longer dated debt, the government must pay a premium over its shorter dated debt, because the risk averse investor prefers a shorter dated debt over longer dated debt as the former tends to deliver utility (e.g., in the form of liquidity) when this is most valuable to the investor (e.g., when there is a recession, when the government generates a primary deficit).²⁵

Adding the risk premium (10), normalized by the growth rate of the economy $1+n$, to the risk free interest rate in equation (8), we have:

²⁵ The link between the covariance between the marginal rate of consumption substitution and the return on the risky asset, and the covariance between the primary surplus and debt service can be established through the relationship $T_t - G_t \leq Y_t - G_t = C_t$.

$$\left[\left(\frac{r^f - n}{1 + n} \right) - \left(\frac{1 + r^f}{1 + n} \right) \text{Cov} \left(\frac{\beta U'(C(s_t))}{U'(C_{t-1})}, 1 + r_t \right) \right] * [d_{\theta T} - pb(s_t)] * v = 1 - \frac{p_{t-1}}{p_t * (1 + n)} \quad (11)$$

Since the risk premium is always positive, the covariance between the marginal rates of substitution to consume and the gross return on the risky asset must be negative.

Equation (11) says that the higher the risk premium that the government must pay, the greater the inflation rate between time $t-1$ and t , unless the cost of risk premium is paid by primary surplus at time t .

Conversely, suppose a low cost/low risk premium debt whose covariance between the marginal rates of consumption substitution and the return on asset is close to zero. This reduces the need for inflation financing or for additional primary surplus compared to a high cost/high risk premium debt. However, the ramification of the low cost debt strategy is that because the payout of the debt tends to increase when the investor's utility of the payout is high, this increase the risk that debt servicing increases precisely at the moment when the government has the least capacity to pay (i.e., during a recession or economic crisis). This will in turn, necessitate future inflation rates to increase. Hence, not only the level of debt at time T , but the decision on the timing of the primary deficits and debt servicing payout and the cost-risk trade-off that the timing decision implies, can cause inflation to increase in future periods.

The discussion above illustrates that because it is possible to find a low financing alternative today at the expense of increasing risk in the future, the flow equation in (11) is incomplete without examining the long-term consequences of the cost-risk trade off and the particular policy mix implemented over time.

Returning to the original Sargent and Wallace (1981) model, in the second stage, it is shown that a tighter monetary policy now implies higher inflation rate later. This is done by demonstrating that the smaller the θ , the higher the $d_{\theta T}$. Re-arranging (2) and substituting $M_t = P_t * GDP_t / v$ with (6) we get, for $t = 2, 3, \dots, T$,

$$d_{\theta} = \left(\frac{1+r}{1+n}\right)d_{\theta(t-1)} - pb_t - \frac{\theta/v}{1+\theta} \quad (2')$$

by repeated substitution, the future value budget constraint at time T can be expressed as:

$$d_{\theta T} = d_1 * \left(\frac{1+r}{1+n}\right)^{T-1} - \sum_{t=2}^T \left(\frac{1+r}{1+n}\right)^{T-t} \left(pb_t + \frac{\theta/v}{1+\theta}\right) \quad (12)$$

Through this equation, it can be seen that the smaller the chosen rate of growth of inflation θ today, the higher the debt level at time T .

We now examine the implication of incorporating debt management in (12). This is achieved by drawing on Bohn (1995). Substituting the safe interest rate with the marginal rates of consumption substitution (9) and a primary balance that depends on the state of nature at time t , we obtain the inter-temporal government budget constraint for $t = 2, \dots, T$ of the following form:

$$d_{\theta T} = d_1 * P(s_{t+k}) - \sum_{k=0}^{\infty} E \left[P(s_{t+k}) * [pb(s_{t+k}) + \left(\frac{M_{t+k} - M_{t+k-1}}{GDP_{t+k} * p_{t+k}}\right)] \right] \quad (13)$$

where $P(s_{t+k}) = \frac{1}{1+n} * \frac{\beta^{-k} U'(C_{t+k-1})}{U'(C(s_{t+k}))}$ denotes equilibrium value of the marginal rate of substitution between time $t+k-1$ and $t+k$ consumption, or the time varying interest rate on the risky debt. Equation (12) states that the future stock of debt at time T given θ is equal to the initial debt less the future value of the expected future primary surpluses and the future seigniorage, compounded by a factor that varies over time and states of nature.

Using the fact that the expectation of a product is the product of the expectations plus the covariance, and using $E_t[1 + r(s_{t+k})] = 1 + r_t^f$, equation (13) can further be re-written as:

$$\begin{aligned} d_{\theta T} = & d_1 * P(s_{t+k}) - \sum_{k=0}^{\infty} \left\{ (1 + r_t^f)^k E \left[pb(s_{t+k}) + \frac{M_{t+k} - M_{t+k-1}}{GDP_{t+k} * p_{t+k}} \right] \right\} \\ & - \sum_{k=0}^{\infty} \left\{ Cov[P(s_{t+k}), pb(s_{t+k})] + Cov \left[P(s_{t+k}), \frac{M_{t+k} - M_{t+k-1}}{GDP_{t+k} * p_{t+k}} \right] \right\} \end{aligned} \quad (14)$$

How does debt management affect the sustainability of fiscal policies? Equation (14) states that even if the sum of the expected value of the primary balance and seigniorage is on average negative, fiscal policy can still be sustainable, *if* the sum of the covariance between the interest payout of the debt and the primary surplus and the covariance between the interest payout and seigniorage are sufficiently positive.²⁶

The “if” is an important qualifier, and depends on whether fiscal policy and monetary policy is conducted pro- or counter-cyclically, and on the insurance that the government purchased in prior periods. To simplify, we let seigniorage be a constant as defined in (6), so (14) becomes:

$$d_{\theta T} = d_1 * P(s_{t+k}) - \sum_{k=0}^{\infty} \left\{ (1 + r_t^f)^k E \left[pb(s_{t+k}) + \left(\frac{\theta/v}{1 + \theta} \right) \right] + Cov[P(s_{t+k}), pb(s_{t+k})] \right\} \quad (15)$$

If fiscal policy is counter-cyclical, i.e., the primary surplus declines during recession, a debt whose payout is low during recession will be desirable. This will produce a positive covariance. The extent to which such a hedge is in place depends on how much hedge is purchased as a result of paying the risk premium in prior periods. Equation (15) says that if the timing of primary balance and debt service payout co-varies and is sufficiently positive, then given $d_{\theta T}$, it can soften the effect that low inflation today will lead to high inflation in the future. Conversely, if the debt manager takes a low cost high risk strategy, the covariance will be low or negative, and this can lead to higher inflation in the future (relative to the certainty case).

Another implication is derived from the likely behavior of (9). When the economy is strong and consumption is growing rapidly, investors’ appetite for risk tends to increase, and when the economy is in recession and consumption growth is declining, investors

²⁶ With risk aversion, the covariances will disappear only if the primary surpluses are uncorrelated with future marginal utility. “In practice, such uncorrelatedness will probably be rare, since it is difficult to imagine a tax and spending policy that is uncorrelated with government spending and with aggregate income, which are the variables determining the marginal utility of consumption” (Bohn: 1995).

become more risk averse. Such investor behavior is reflected in the risk premium which moves in opposite direction with consumption growth.²⁷

The fact that the investor's risk aversion is counter-cyclical poses a dilemma for the government that wants to hold $d_{\theta T}$ constant after time T . The problem for the government in a world with time varying risk averse investor with counter-cyclical properties is that the cost of issuing debt will be high in bad times, precisely when the government does not want to raise taxes and would rather run a primary deficit and finance the deficit through debt issuance. On the other hand, if the hedge is purchased during good times when investor's risk appetite is great and the risk premium is low, the timing of the purchase coincides with the timing when the government can most afford it. This implies that the hedge must be purchased in good times financed by the primary surplus or seigniorage. If this is deferred to later periods when the situation deteriorates, the debt manager is compelled to purchase future hedges at a high cost, precisely at the moment when it can least afford it.

4. Applications: Games Policy Makers Play

Having set out the analytical framework, we now examine the consequences of uncoordinated mix of fiscal, monetary, and debt management policies. The objective is to illustrate the types of policy switching necessary if sustainability conditions do not hold.²⁸ We do so by building on Sargent and Wallace (1993) who examined the consequences of uncoordinated fiscal and monetary policies, whereby the fiscal authority chose a course of policy without regard to any coordinated policy goals. The central bank, on the other hand, pursued a responsible monetary policy fighting inflation. Under this uncoordinated policy scheme, they showed how policies became unsustainable unless either of the authorities adjusted its original course of policy. We extend this game by overlaying debt management to the original games under fiscal and monetary

²⁷ The time variance of the risk premium reflects the risk aversion of the investor whose marginal rate of substitution of consumption utility falls during good times and rises during bad times.

²⁸ Bohn (1991) suggested that if there remained any positive probability that sustainability might not hold, then there should be a complete description of the policy rule that would be followed in the event that sustainability condition were to be violated.

dominance regimes. We present the debt manager as the weak policy player dominated by the other policy authorities.

(a) Fiscal dominance with debt management

Suppose a fiscal dominant regime similar to Sargent and Wallace (1993), where the fiscal authority pursues an irresponsible policy and does not change the policy course. Assume that the monetary authority implements a constant inflation policy, such as (5).²⁹ In addition, assume a weak debt manager subordinate to the fiscal authority. Given this institutional setting, the fiscal authority pressures the debt manager to reduce current period debt servicing costs to contain the overall budget deficit. As a result, the debt manager issues low cost but high risk debt. This is achieved by issuing debt with low risk premium in equation (10). As equation (11) suggests, low risk premium requires less seigniorage that the monetary authority has to generate to finance the deficit.

As a consequence, in the short run, the fiscal authority is able to continue with irresponsible policies without forcing the monetary authority to adjust. But the medium-term outlook presents a different picture: sustainability of the debt becomes suspect, not only because of the accumulation of primary deficits generated by the fiscal authorities, but also because of the increase in the riskiness of the debt portfolio.³⁰ In the end, as fiscal adjustment will not take place under this regime, the monetary authority will have to give in and deficit must be financed through increases in seigniorage. But by this time, the accumulated debt is greater than in the original fiscal dominance case in Sargent and Wallace, and the inflation adjustment required by the monetary authority will correspondingly be greater.³¹ An alternative outcome may be that the monetary authority

²⁹ The impact of a tight monetary policy on fiscal policy and debt management policy is likely to be high, through its impact on slower economic growth, lower tax revenues, and higher interest costs, but we are not considering these effects here.

³⁰ In addition to increased interest cost due to the increase in interest rate relative to the growth rate of the economy, foreign currency debt to GDP ratio measured in domestic currency unit may suffer large capital losses if there is a devaluation. Debt whose principal is indexed may also suffer capital losses in the event of a sudden increase in the index value. This is captured in the negative covariance between debt service and the primary surplus in equation (14).

³¹ This is due to the increased debt servicing cost arising from the accumulation of the negative covariance between debt servicing and the primary surplus, in addition to the continuation of the policy of accumulating primary deficit made possible by the low cost, high risk debt management strategy.

is forced to conduct a policy in which there is co-movement between debt service payout and money supply to finance the debt service in equation (14).

Another policy implication refers to the timing of policy adjustments. In Sargent and Wallace, it was shown that if the demand for government bonds implied an interest rate on bonds greater than the rate of growth of the economy, then the monetary authority trying to fight current inflation would eventually have to let inflation loose as debt approached unsustainable levels. Incorporating debt management compounds to this effect through the higher than expected realized payout as a result of issuing low cost high risk debt.

(b) Monetary dominance with debt management

Where there is monetary dominance, the monetary authority determines the quantity of money base and therefore the price level through a set formula, for example, (4).³² Suppose the monetary authority sets money supply to a constant, $M_t = M_{t-1}$, so that seigniorage $\sigma = 0$. Under this regime, government deficits have no bearing on the rate of inflation because they have no effect on the path of base money. With the possibility of monetization ruled out, the policy adjustments must come from the fiscal authority or the debt manager. But with a fiscal authority unwilling to adjust its policy path, it again pressures the debt manager to lower the cost of financing to reduce current period debt servicing cost. This will create fiscal space and buys some time for the fiscal authority, but at the expense of increased future risk in the debt portfolio. However, with the actual or prospective realization of a risky event, debt becomes unsustainable. Because the possibility of seigniorage is ruled out, it is eventually the fiscal authority that has to adjust. However, as in the case of fiscal dominance regime, by this time, the debt level is likely to be greater than in the original Sargent and Wallace case, as it is compounded by increases in interest costs and capital losses arising from poor debt structures; therefore the fiscal adjustment required will correspondingly greater.³³

³² We are ignoring the impact that such a monetary rule might have on real interest rates.

³³ Again, this is due to the increased debt servicing cost arising from the accumulation of the negative covariance between debt servicing and the primary surplus, in addition to the continuation of the policy of accumulating primary deficit.

The analysis may be extended to a world where weak debt management is combined with the accumulation of implicit or explicit contingent liabilities. The threat of realization of the contingent liabilities, such as calls on guarantees, bail out of the banking sector, recapitalization of the central bank or other public sector institutions, or the collapse of the fixed exchange rate regime, can lead to pressures to lower current period financing cost. Such pressures can buy little time, but not much. Indeed, it is likely to lead to greater pressures leading governments into solvency crisis, even under prudent fiscal policy (for example during the Asian financial crisis of 1997). Because monetary policy is not accommodative, ultimately the burden of policy adjustment falls on the fiscal authority.

Consider now a variation in the monetary dominant regime. Imagine the case where monetary policy lacks credibility. The monetary authority therefore pressures the debt manager to issue risky debt (such as short-term debt) to ensure the time consistency of monetary policy (see for example Calvo and Guidotti: 1990). To distinguish from the previous example, suppose that instead of an irresponsible policy, the fiscal authority initially runs a responsible policy so that there is primary surplus, on average. However, as Bohn (1991) showed, sound fiscal policy unsupported by sound debt management raises the possibility that debt will become unsustainable. In practice, the possibility or severity of a sustainability crisis will be much lower than the example where poor debt management is combined with poor fiscal policy.³⁴ However, the consequence of such a policy mix might be a liquidity crisis which could force the fiscal authority to adjust, i.e., they may have to cut expenditures and/or raise tax revenues during a recession or a crisis, forcing the fiscal authorities to conduct a pro-cyclical fiscal policy, accentuating recessions and booms. Paradoxically, the attempt by the monetary authority to ensure time consistency results to be an inconsistent policy mix after all.

Several financial crises in the late 1990s have demonstrated evidence that fiscal dominance and (excessive) monetary dominance have forced debt managers into low

³⁴ Risky debt structures by itself is unlikely to generate a sustainability crisis if debt levels are low.

cost/high risk strategy. For example, in Brazil, until about May of 1998, debt management had been in the process of extending the maturity of the domestic bonds. As a result, it was able to weather the first financial shock arising from the Asian crisis, despite rising debt levels arising from lax fiscal policy and the realization of large contingent liabilities in 1997. However, with the onset of the Russian crisis, the central bank once again raised domestic interest rates in order to defend the local currency, the Reais, which was fixed against the US\$. By May 1998, the government decided that it was too expensive to lengthen the maturity of the domestic debt and decided to reverse its course and began issuing short term debt, thinking that the hike in interest rate was temporary. They also increased the issuance of foreign exchange linked debt. However, interest rates did not come down as the authorities had hoped. As speculative attack on the Reais mounted, investors became less willing to purchase long term domestic paper even at high interest rates. As short term debt accumulated, and the central bank's intervention in the foreign exchange market led to rapidly declining reserves, the government's ability to roll over debt became questionable. Speculative attacks on the currency finally lead the central bank to change its policy course, allowing the Reais to devalue in early 1999. The fiscal authority also changed its course setting a target for the primary surplus.

5. Conclusions

This paper discussed the desirability of policy separation between fiscal policy, monetary policy and debt management. The asset and liability management framework assist in identifying and managing the macroeconomic risks of uncoordinated policies. The consequences of uncoordinated policy mix was illustrated extending the Sargent and Wallace (1981 and 1993) analysis with debt management. Examples of policy games between fiscal policy, monetary policy, and debt management illustrated how a weak debt manager without a separate policy goal could lead to inconsistent policy mix.

In particular, the paper illustrated how decision by the debt manager can have important trade-off implications for the fiscal and monetary authorities in determining their policies

over time. If the debt manager chooses to lower cost (this period) by increasing risk (in the next period) there will be greater (short run) fiscal space for the fiscal authorities, and there will be greater scope for the central bank to conduct a tight monetary policy today. However, if in the next period, the bad state of nature materializes and the debt servicing cost suddenly increases, the fiscal authority loses its fiscal space gained in the previous period, and may even have to contract its policy to pay for the increased debt servicing. If the fiscal authority cannot generate primary surplus in the next period (say because the timing coincides with a recession), then the central bank may have to loosen up its monetary policy to increase seigniorage.³⁵ If the fiscal authority has to adjust, it will effectively be forced to conduct a pro-cyclical fiscal policy. The lessons in these cases suggest that debt management should not be used to support monetary policy or poor fiscal policy. It points to the importance of policy coordination to ensure that the policy mix is consistent and sustainable.

It was also shown that debt management can buy time, but procrastination of policy adjustment can be much more costly over the longer term than the case where short-term fiscal expediency is not allowed to dominate debt management. Thus, “crises are more frequent and more severe when short-term borrowing and dollar denominated external debt are high, and foreign direct investment and reserves are low, in large part because balance sheets are then very sensitive to increases in exchange rates and short-term interest rates...If countries that are faced with a fall in capital inflows adjusted more promptly, rather than stalling for time by running down reserves or shifting to loans that are shorter-termed and dollar-denominated, they might be able to adjust on more attractive terms...It is precisely the decision to delay adjustment that leaves crisis victims with few good options, because balance sheets have deteriorated in the mean time” (Frankel and Wei: 2005).

Another policy implication is that the initial debt to GDP ratio should be lower, or the desired primary surplus should be higher, the higher the risk premium charged and/or the

³⁵ If the recession is caused by a supply shock accompanied by high inflation, the timing of monetary loosening to ensure fiscal sustainability could aggravate inflation.

higher the vulnerability arising from poor debt structures. The IMF has calculated that given greater vulnerability of emerging market economies, the maximum sustainable debt level in these countries was much lower than the equivalent for OECD countries.³⁶

Future work can usefully extend the analysis to test its empirical relevance. For example, Herrera (2004) describes the sequence of policy actions and evolution of the macroeconomic policy mix including debt management in Brazil, and Pinto, Gurvich, and Ulatov (2004) describe this for Russia, which can be useful in identifying the timing of policy shifts and changes in the composition of debt and their relationship with fiscal and monetary policies. Another area of research is a closer examination of the cyclical characteristics of monetary policy and its impact on debt management. For example, Kaminsky, Reinhart and Végh (2004) showed that monetary policy tends to be conducted pro-cyclically in developing countries. Coupled with the pro-cyclical tendency of fiscal policy (see for example, Gavin and Perotti: 1997, and Talvi and Vegh: 2000 in Latin America), it would be useful to examine the implications of debt management on pro-cyclical monetary policy.

³⁶ See for example, IMF (2003) *World Economic Outlook*, 'Public Debt in Emerging Markets', September.

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